Looking for seasonal changes in Imhotep with MIRO

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Context

Context

1. Context
2. Model of the subsurface
3. Results

The ToO#7:

- First observation: October 27th 2014 as a single swath.

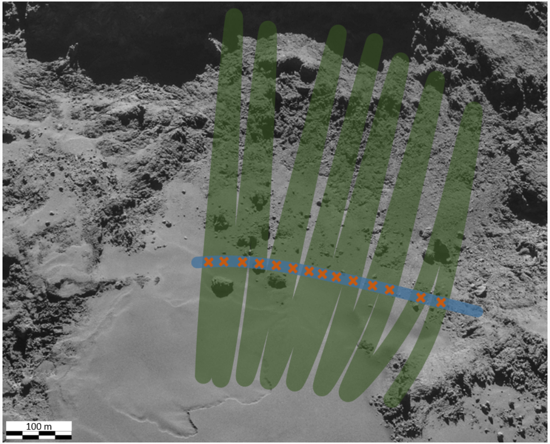

Figure 1: NAVCAM image of the Imhotep region with indicated the 2014 and 2016 swaths. Copyright: ESA/Rosetta/NAVCAM

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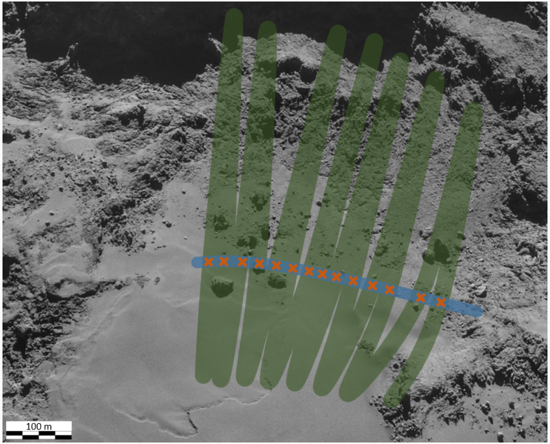

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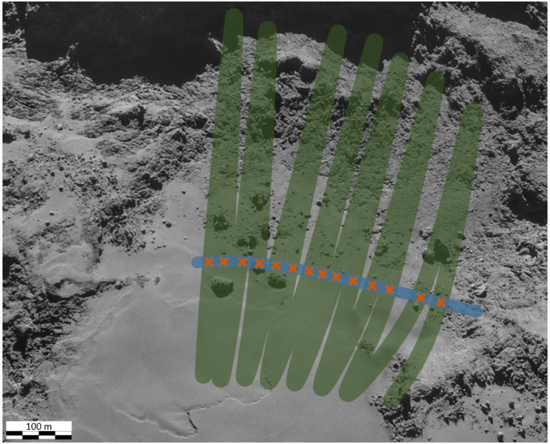
The ToO#7:

- First observation: October 27th 2014 as a single swath.
- Second observation: July 9th 2016 as a raster scan.
- Objective: observe the same area twice with similar high spatial resolution.



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Measurements

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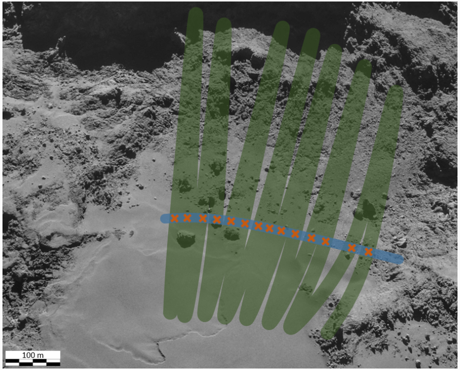

Figure 2: NAVCAM image of the Imhotep region with indicated the 2014 and 2016 swaths. Copyright: ESA/Rosetta/NAVCAM

Resolution	SMM	MM
October 2014	$\approx 20m$	$\approx 60m$
July 2016	$\approx 30m$	$\approx 90m$

The 2016 raster scan intersected the 2014 swath a total of 14 times.

What measurements to use ?

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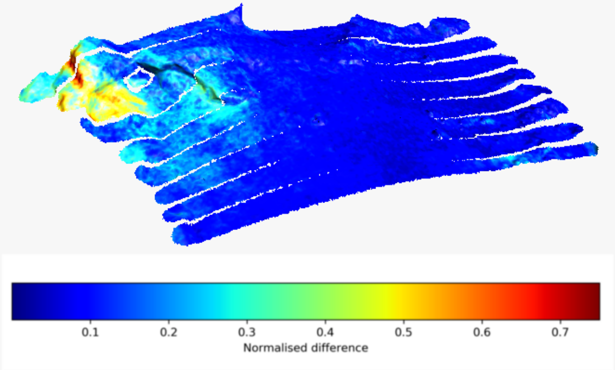

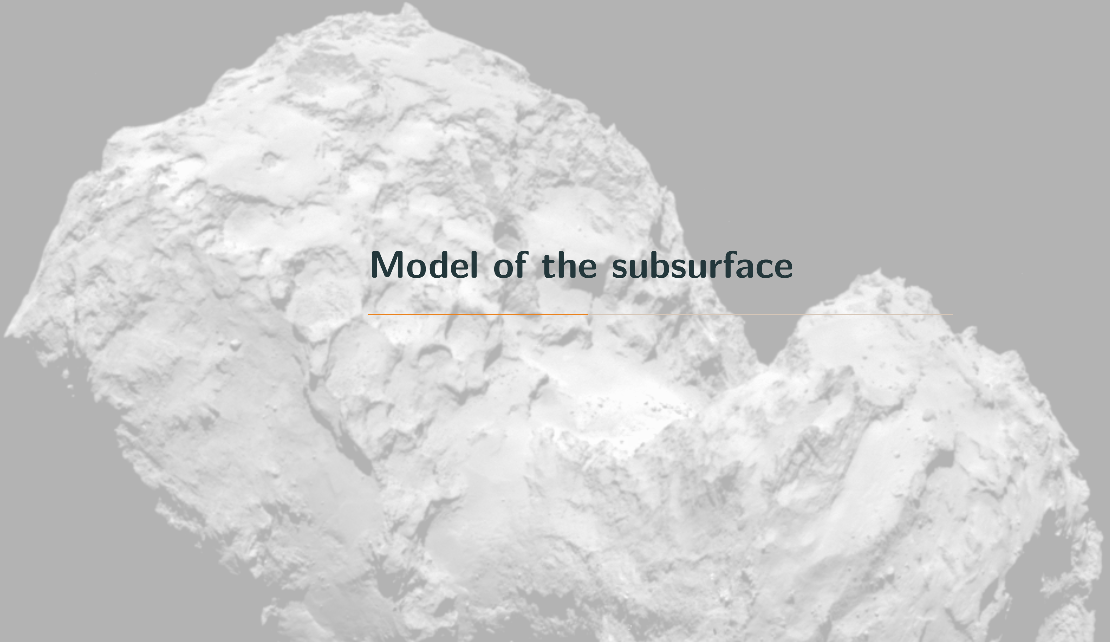

Model of the subsurface

Thermal and radiative model

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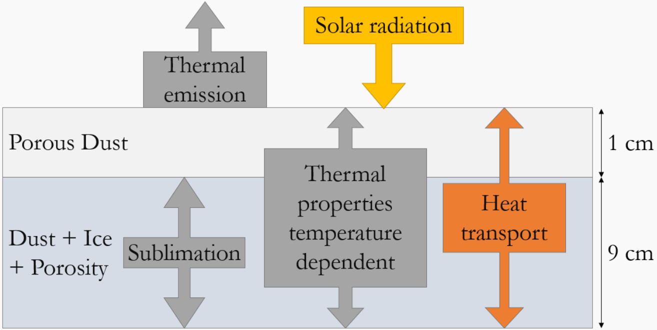

Figure 3: Simplified thermal model of the subsurface of 67P/C-G, indicating the processes at play

Thermal and radiative model

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Parameters	MM (188 GHz)	SMM (562 GHz)
Pure dust density (Kg/m^3)	2000	
Pure ice density (Kg/m^3)	925	
Emissivity	0.9	
Albedo	0.06	
Particulate size	400 μm	
Penetration depth	$\approx 4cm$	$\approx 1cm$
Upper layer porosity	80%	
Lower layer thermal conductivity	Variable	
Lower layer density		

Results

Fit of the model to the measurements - 2014

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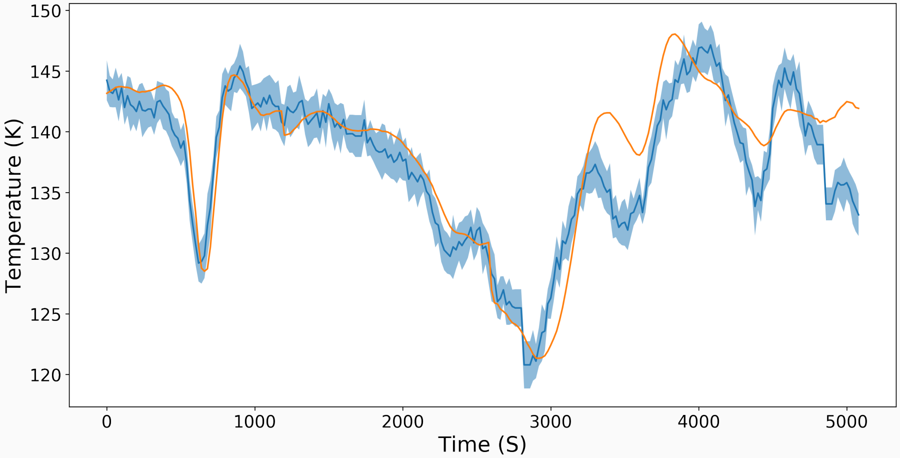

Fit of the model to the measurements - 2016

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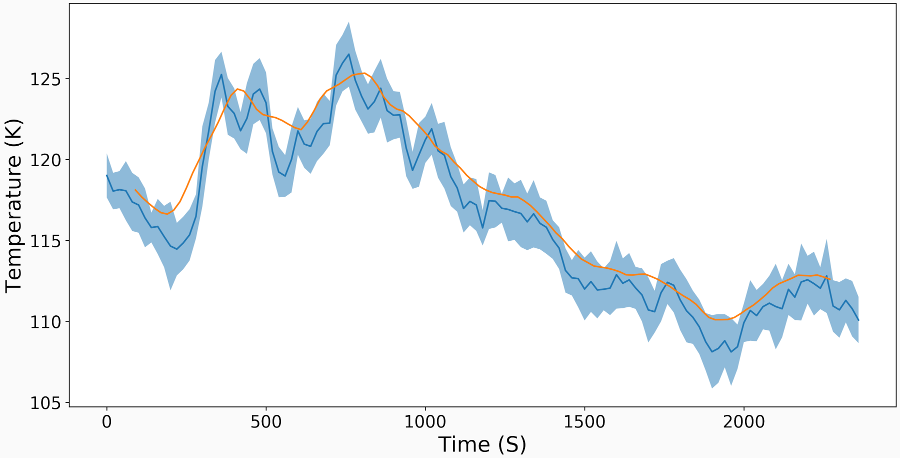

Constraints of the subsurface 2014

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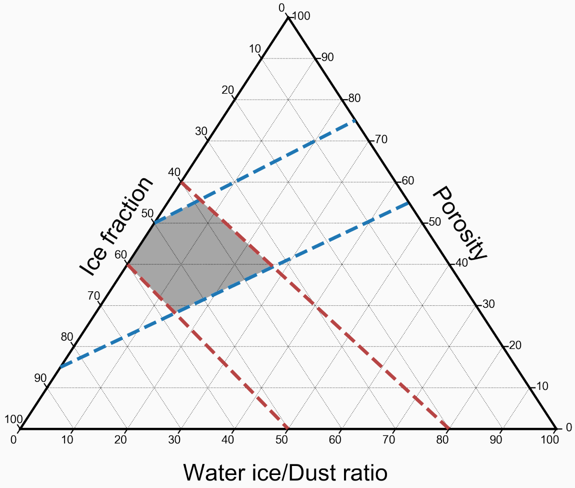

Constraints of the subsurface 2016

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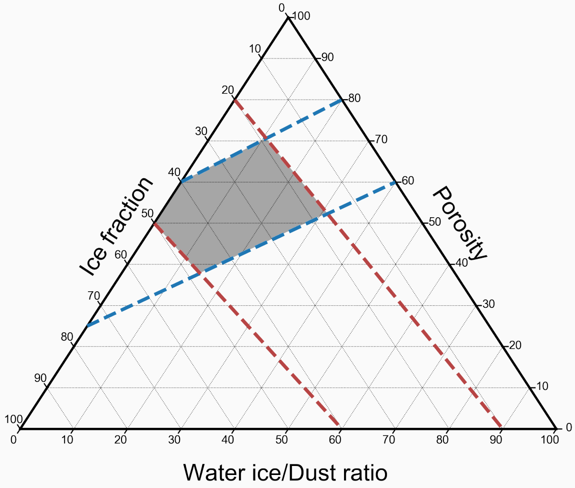

Changes in the subsurface properties

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Phase	2014	2016
Dust	0-28%	0-32%
Water ice	45-70%	30-60%
Vacuum	30-55%	40-70%

Conclusions

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Conclusions

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- The fit of the model to the measurements can still be improved.
- Values presented and error bars are not final
- Between the 2014 (before perihelion) and 2016 (after perihelion) the constraints on the subsurface shift towards lower water ice fraction and densities.

Perspectives

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3. Results

- The model used in this work offers a powerful tool to investigate the subsurface of 67P/C-G using MIRO data and can help constrain the composition of the subsurface and its evolution through time.

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- The model used in this work offers a powerful tool to investigate the subsurface of 67P/C-G using MIRO data and can help constrain the composition of the subsurface and its evolution through time.
- More parameters need to be investigated in order to better fit the measurements of the Imhotep region measurements.

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- The model used in this work offers a powerful tool to investigate the subsurface of 67P/C-G using MIRO data and can help constrain the composition of the subsurface and its evolution through time.
- More parameters need to be investigated in order to better fit the measurements of the Imhotep region measurements.
- MIRO made observations of Imhotep at other times, and these will be included in future studies.